

# PATENT SPECIFICATION

NO DRAWINGS

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836.988

Date of filing Complete Specification (under Section 3 (3) of the Patents  
Act, 1949) July 26, 1956.

Application Date July 27, 1955.

Application Date Feb. 22, 1956.

Complete Specification Published June 9, 1960.

No. 2186/55.

No. 5571/55.

Index at acceptance: —Classes 15(2), A1(A1B3: A1B5: A5: C1A: CX); and 91, D2(E: F: G: H: L:  
N: P: Q: V), S2(E: F: G: H: L: N: P: Q: V).

International Classification: —C11d. D06l.

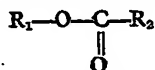
## COMPLETE SPECIFICATION

### Improvements in or relating to Bleaching and Detergent Compositions

- We, UNILEVER LIMITED, a Company registered under the laws of Great Britain, of Port Sunlight, in the County of Chester, England, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to processes of bleaching and to bleaching compositions; in particular it relates to processes and to compositions suitable for removing stains from textile materials.
- Many detergent compositions contain an inorganic per-salt such as sodium perborate or percarbonate to provide bleaching properties. These per-salts provide a satisfactory bleach when the detergent is used at the boil, but at lower temperatures their action is rather slow. This disadvantage is becoming important with growing use of washing machines which operate at a temperature of, for example, 50—60° C. It is an object of the present invention to provide a more effective bleach in the normal washing period at this temperature than is obtained with the per-salt alone.
- Processes and compositions according to the invention also find application in the textile industry and in commercial laundering.
- It has been found that improvements in bleaching can be obtained by the use of an aqueous solution containing hydrogen peroxide and an organic carboxylic ester as characterised below.
- It has further been found that improved bleaching compositions can be provided which contain an inorganic per-salt together with an organic carboxylic ester having one or more ester groupings in the molecule. The esters which are suitable for use according to the invention are characterised by the following test:—
- To a solution at 60° C. containing the following in 1000 ml. of distilled water:—
- |       |  |    |
|-------|--|----|
| 2.5   | gms. $\text{Na}_2\text{P}_2\text{O}_7 \cdot 10\text{H}_2\text{O}$        | 45 |
| 0.615 | gms $\text{NaBO}_2 \cdot \text{H}_2\text{O}_2 \cdot 3\text{H}_2\text{O}$ |    |
|       | (at 10.4% available oxygen)  |    |
| 0.5   | gms. sodium tetra propylene benzene sulphonate                           | 50 |
- is added an amount of ester, in equimolecular ratio to the available oxygen. Water-soluble esters and those which are liquid at 60° C. are added direct to the aqueous solution; other esters should be dissolved in 10 ml. ethyl alcohol, before addition, the volume of distilled water being reduced in such cases to 990 ml. The mixture is mechanically stirred by means of a  $\frac{3}{4}$ " glass stirrer at 600 revs. per minute and maintained at 60° C. After 5 minutes a 100 ml. aliquot is withdrawn and immediately pipetted on to a mixture of 250 gm. of cracked ice and 15 ml. of glacial acetic acid. 0.4 gm. of potassium iodide is then added. The liberated iodine is immediately titrated with 0.1N sodium thiosulphate, using starch as indicator, until the first disappearance of the blue colour.
- Esters, which give a titre of 1.5 ml. or more in this test, may be used in bleaching compositions and processes according to the invention.
- According to the present invention there is provided a bleaching process in which an aqueous solution of hydrogen peroxide and an organic carboxylic ester which gives a titre of not less than 1.5 ml. of 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  in the test defined above, is used.
- The present invention further provides a bleaching composition which contains an inorganic per-salt together with an organic car-

boxylic ester which gives a titre of not less than 1.5 ml. of 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  in the test defined above.

- 5 Esters, which give a titre of not less than 1.5 ml. 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  in the test defined above and hence may be used according to the invention, include compounds within the class



- 10 where  $\text{R}_1$ , attached to the oxygen atom of the ester link, exerts an electron-attracting effect; and  $\text{R}_2$  may be an alkyl, aryl or alicyclic radical or a substituted alkyl, aryl or alicyclic radical.

- 15 The esters should not yield easily oxidisable hydrolysis products such as polyhydric phenols, unsubstituted lower aliphatic aldehydes, and alpha and beta diketones.

- 20 Examples of esters within the scope of the invention, that is which give a titre of at least 1.5 ml. 0.1 N  $\text{Na}_2\text{S}_2\text{O}_3$  in the test defined above, are found in the following classes:—

(a) Esters of phenols and substituted phenols,

- 25 Examples are:—

Phenyl acetate  
Phenyl benzoate  
Phenyl p-nitrobenzoate  
Phenyl cinnamate

- 30 p-cresyl acetate  
o-nitro phenyl benzoate  
o-carboxy phenyl benzoate  
o-carboxy phenyl acetate  
p-carboxy phenyl acetate

- 35 p-phenyl phenyl acetate  
Phenyl furoate  
p-bromophenyl benzoate  
Benzoyl ester of commercial (potassium or sodium) phenol sulphonate

- 40 Phenyl nicotinate  
(b) Esters of monohydric aliphatic alcohols containing substituents which exert an electron-attracting influence, such as trichloroethyl—an example is:—

- 45 Trichloroethyl acetate  
(c) Esters of polyhydric aliphatic alcohols containing several ester groups situated on adjacent carbon atoms, particularly,  
Mannitol hexa acetate

- 50 Sorbitol hexa acetate  
(d) Esters of mono- and disaccharides containing preferably 3 or more ester groups on adjacent carbon atoms—examples are:—

- 55 Fructose penta acetate  
Glucose penta acetate  
Glucose tetra acetate  
Sucrose octa acetate

- (e) Esters containing 2 ester groups attached to the same carbon atom such as may be obtained by acylation of aldehydes, examples are:—

p-nitrobenzaldehyde diacetate  
Glycollic aldehyde triacetate  
Benzaldehyde diacetate  
Furfural diacetate  
Chloral diacetate

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(f) Esters of the enolic forms of ketones, preferably not alpha- and beta-diketones or other readily oxidisable ketones, examples are:—

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$\Delta^1$ -cyclohexenyl acetate  
Isopropenyl acetate

(g) Esters of N-substituted derivatives of hydroxylamine, an example is:—

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Acetyl aceto hydroxamic acid.

Solid esters lend themselves readily to incorporation in compositions in solid form. Water-insoluble solid esters should, however, be in a finely-divided state in a solid composition.

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Hydrogen peroxide cannot, of course, be included in a solid composition, and bleaching solutions prepared from hydrogen peroxide should be prepared as required for use.

The hydrogen peroxide may be added to the solution as such, or may be liberated *in situ* from a per-salt.

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By "inorganic per-salt" is meant a salt which will give rise to hydrogen peroxide in aqueous solution. Suitable compounds are alkali metal perborates, percarbonates, perpyrophosphates and persulfates. These are not true per-salts in the strict chemical sense but are believed to contain hydrogen peroxide of crystallisation, which is liberated in aqueous solution.

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The invention can be applied to bleaching baths such as are used for treating textiles, to wash liquors, such as are used in commercial laundering and to solid bleaching compositions. Solid bleaching compositions may contain, in addition to a per-salt and an ester according to the invention, inert salts, alkaline agents and a small proportion of detergent. The invention may further be applied to detergent compositions, which will contain an organic detergent, which may be soap or an organic soapless detergent. Suitable organic soapless detergents are the alkyl aryl sulphonates, alkyl sulphates and the salts of esters or ethers of isethionic acid.

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Compositions according to the invention should preferably contain one or more alkaline substances, in amounts such that similar compositions not containing esters would give a pH value within the range 9—11 when dissolved at the desired bleaching concentration. Most common detergent compositions contain alkaline material sufficient for this purpose. Suitable alkaline materials are, for instance, soap, alkali metal carbonates, phosphates (including orthophosphates, and water-soluble condensed phosphates, such as tripolyphosphates, and pyro phosphates) and silicates.

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When the invention is applied to bleaching or wash liquors, alkali sufficient to give an

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initial pH of 9—11 is preferably present in the bleaching or wash liquor before addition of the ester.

5 Compositions according to the invention may contain any of the conventional adjuncts present in detergent compositions. There may be mentioned, supplementary builders, inert and organic materials such as alkali metal sulphates, chlorides, carboxymethyl cellulose and fluorescent agents.

10 Compositions according to the invention must not contain water in an amount sufficient to permit appreciable chemical reaction between the components prior to use.

15 The proportions of per-salt and ester which may be present in compositions according to the invention will depend on the time and temperature of bleaching, the degree of bleaching required, the concentration of the bleaching solution and the individual ester and per-salt used. Under most conditions, these proportions should be such as to give a per-salt concentration in solution equivalent to 0.001 to 0.1% available oxygen.

25 Having regard to these factors, bleaching effects may be obtained with compositions according to the invention containing widely varying ratios of per-salt to ester. It is convenient to measure the activity of the per-salt in terms of available oxygen. Generally, ratios of from  $\frac{1}{2}$  to 2 and particularly from  $\frac{1}{2}$  to  $1\frac{1}{2}$  molecules of ester per one atom of available oxygen are preferred. (In converting such ratios to ratios by weight, account must be taken of the molecular weight of the ester and the available oxygen content of the per-salt used). In particular, it is preferred to use approximately chemically equivalent amounts of ester and per-salt. In determining such chemically equivalent amounts it should be realised that with esters containing more than one ester grouping, not all the ester groups will necessarily react with the available oxygen of the per-salt. Thus, with aldehyde diacetates, only one group is believed to react, with glucose tetraacetate one group reacts and with glucose pentaacetate two groups react.

45 When solutions are used which are obtained by adding hydrogen peroxide and an ester according to the invention to an alkaline bath, the preferred weight ratio is from 2 to 15 parts of ester to 1 part of hydrogen peroxide (100%) depending on the molecular weight of the ester used.

50 When compositions according to the invention are to be used primarily as a bleach, for instance, for addition to alkaline textile bleaching baths or wash liquors, such compositions may contain any proportion of ester and per-salt, these components being preferably present in the ratio  $\frac{1}{2}$  to 2 molecules of ester per one atom of available oxygen, preferably  $\frac{1}{2}$  to  $1\frac{1}{2}$  molecules per one atom of available oxygen. Thus, by way of example, a composition may contain 33% of per-salt having 10%

available oxygen and 67% of the benzoyl ester of commercial sodium phenol sulphonate. Using per-salt having 15% available oxygen, the composition may contain 25% of the per-salt and 75% of the benzoyl ester of commercial sodium phenol sulphonate.

70 When an organic detergent is present in compositions according to the invention, improvements in bleaching can be obtained at normal washing concentrations. Thus, for example, using a detergent composition according to the invention at a concentration of 1% in aqueous solution, improvements may be obtained if amounts of as little as 1% of per-salt and 2% of ester by weight of the composition are present. In such compositions, however, the amount of per-salt taken should provide at least 0.1% available oxygen based on the composition. Generally, detergent compositions will contain from about 10 to about 50% by weight of organic detergent. The mixed ester/per-salt content may be as high as 70% by weight provided that these components are taken in ratios of  $\frac{1}{2}$  to 2, preferably  $\frac{1}{2}$  to  $1\frac{1}{2}$ , molecules of ester per one atom of available oxygen. Effective proportions of ester and per-salt in detergent compositions will in general lie within the range from 2 to 30% of ester and 1 to 15% of per-salt by weight of the composition.

95 Best results in bleaching according to the invention are obtained under conditions of effective agitation such as exist, for instance, in a washing machine.

The following examples illustrate the invention:—

#### EXAMPLE 1

A bleach bath at 60° C. was prepared containing the following ingredients:—

0.5% tetrasodium pyrophosphate  
0.021% hydrogen peroxide ( as 100%  $\text{H}_2\text{O}_2$  )

0.136% chloral diacetate  
the ingredients being added in the above order.

110 A length of cotton cloth was stained by immersion in boiling tea extract for one hour. It was then thoroughly rinsed, dried and cut into test-pieces whose % reflectances were measured in a Hunter reflectometer using the blue-filter. The % reflectance of the test pieces was measured again after bleaching. The bleach obtained was expressed as the difference in the two % reflectance readings on each test-piece.

120 A piece of tea-stained cotton cloth was immersed in the bleach bath, at a cloth to liquor ratio of 1 to 20, and stirred for 15 minutes, the temperature being maintained at  $60 \pm 2^\circ \text{C}$ . After this time the cloth was rinsed three times, ironed and its % reflectance measured. The increase in % reflectance was 22.7. In a similar control experiment carried out in the absence of chloral diacetate the increase in % reflectance was only 13.7.

## EXAMPLE 2

A spray-dried detergent powder had the following percentage composition:—

5	%	21.9 sodium dodecyl (tetrapropylene) benzene sulphonate
		2.7 lauryl isopropanolamide
		19.7 tetrasodium pyrophosphate
		15.3 pentasodium tripolyphosphate
10		5.5 alkaline sodium silicate (anhydrous)
		1.6 sodium carboxymethyl cellulose (60%)
		21.3 sodium sulphate
		12.0 moisture
15		100.0

To 77.3 parts of this detergent powder was added 10 parts of sodium perborate tetrahydrate and 12.7 parts of glucose penta-acetate and the whole was mixed.

- 20 An 0.5% solution of the finished composition was prepared at 60° C. and a tea-stained cloth, prepared as described in Example 1, was then immersed and stirred for 15 minutes, the temperature being maintained at 60±2° C. The cloth was then rinsed three times, ironed and its % reflectance measured. The increase in % reflectance was 19.0. In a control experiment without glucose penta-acetate the increase in % reflectance was only 13.2.

## EXAMPLE 3

To 76.4 parts of a soap powder containing:—

35	50.4% sodium soap
	16.0% sodium carbonate
	2.8% anhydrous neutral sodium silicate
	30.8% water

- 40 was added 8.0 parts of sodium perborate tetrahydrate and 15.6 parts of the benzoyl ester of commercial sodium phenol sulphonate and the whole was mixed. An 0.8% solution of the finished product was prepared at 60° C. To this solution was added a tea-stained cloth at a cloth to liquor ratio of 1 to 20 and stirred for 15 minutes, the temperature being maintained at 60±2° C. The cloth was then rinsed 3 times, ironed and its % reflectance measured. The % increase in reflectance was 20.0. In a control test in the absence of ester the increase in % reflectance was only 14.3.

In the specified titration test the esters used in the above examples gave the following:—

55	Ester	Titration ml. 0.1N sodium thio-sulphate
	Chloral diacetate	4.6
	Glucose penta-acetate	4.3
60	Benzoyl ester of commercial sodium phenol sulphonate	6.5

WHAT WE CLAIM IS:—

1. A bleaching process which comprises the

use of an aqueous solution of hydrogen peroxide and a carboxylic ester having a titre, in the test defined herein, of not less than 1.5 ml. 0.1N Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>. 65

2. A process according to Claim 1 in which hydrogen peroxide is liberated from a per-salt in the solution.

3. A process according to Claim 1 or Claim 2 in which an alkaline material is present in the solution. 70

4. A process according to any preceding claim in which the ratio of ester to hydrogen peroxide is from 1/2 to 2 molecules of ester per one atom of available oxygen. 75

5. A process according to Claim 4 in which the ratio of ester to hydrogen peroxide is within the ratio of 2 to 15 parts of ester to one part of hydrogen peroxide (100% H<sub>2</sub>O<sub>2</sub>) by weight. 80

6. A process according to any preceding claim, in which the ester is the benzoyl ester of commercial (sodium or potassium) phenol sulphonate. 85

7. A composition which contains an inorganic per-salt and an organic carboxylic ester which gives a titre, in the test defined herein, of not less than 1.5 ml. 0.1N Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>.

8. A composition according to Claim 7 which contains an alkaline material. 90

9. A composition according to Claim 7 or Claim 8 which contains an organic detergent.

10. A composition according to Claim 9 in which the organic detergent is soap. 95

11. A composition according to Claim 9 in which the organic detergent is a soapless detergent.

12. A composition according to any of Claims 8 to 11 inclusive, which contains a water-soluble condensed phosphate. 100

13. A composition according to any of Claims 8 to 12 inclusive which contains a water-soluble silicate.

14. A composition according to any of Claims 7 to 13 inclusive in which the ratio of ester to per-salt is within the ratio 1/2 to 2 molecules of ester per one atom of available oxygen. 105

15. A composition according to any of Claims 9 to 14 inclusive which contains from 2 to 30%, by weight of the composition, of the ester and from 1 to 15%, by weight of the composition, of the per-salt. 110

16. A composition according to any of Claims 8 to 15 inclusive in which the ester is a phenyl ester of a carboxylic acid. 115

17. A composition according to Claim 16 in which the phenyl ester is phenyl benzoate.

18. A composition according to Claim 16 in which the phenyl ester is the benzoyl ester of commercial (potassium or sodium) phenol sulphonate. 120

19. A bleaching process substantially as hereinbefore described. 125

20. A bleaching composition substantially as hereinbefore described.

UNILEVER LIMITED,  
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Agent for the Applicants.

PROVISIONAL SPECIFICATION  
No. 21686, A.D. 1955.

Improvements in or relating to Bleaching and Detergent Compositions

We, UNILEVER LIMITED, a Company registered under the laws of Great Britain, of Port Sunlight, in the County of Chester, England, do hereby declare this invention to be described in the following statement:—

This invention relates to bleaching compositions, and in particular to compositions suitable for removing stains from textile materials.

Many detergent compositions contain an inorganic per-salt such as sodium perborate or percarbonate to provide bleaching properties. These per-salts provide a satisfactory bleach when the detergent is used at the boil, but at lower temperatures their action is too slow to be really effective within the normal washing time. This disadvantage is becoming important with the growing use of washing machines which operate at a temperature of about 60° C. It is an object of the present invention to provide a more effective bleach in the normal washing period at this temperature than is obtained with the per-salt alone.

The present invention provides a bleaching composition comprising an inorganic per-salt and a phenolic ester of a carboxylic acid.

By "inorganic per-salt" is meant a salt which will give rise to hydrogen peroxide in aqueous solution. Suitable compounds are alkali metal perborates, percarbonates, perpyrophosphates and persulfates. These are not true per-salts in a strictly chemical sense, but are believed to contain hydrogen peroxide of crystallisation, which is liberated in aqueous solution.

Suitable phenolic esters of carboxylic acids are

phenyl acetate  
phenyl benzoate  
phenyl p-nitrobenzoate  
phenyl o-toluate  
beta-naphthyl benzoate  
p-cresyl acetate  
p-tert-butyl phenyl acetate  
sodium salt of o-carboxy phenyl acetate

The ester molecule should not contain any grouping which has a deleterious effect, for example, by forming a coloured product on interaction with the per-salt.

Approximately equimolar proportions of per-salt and ester have been found effective, a slight excess of ester being preferred. However, bleaching effects may be obtained with widely varying proportions of per-salt to

ester. The amounts of per-salt and ester required in the composition according to the invention will depend on the time and temperature of bleaching, the degree of bleach required, and the concentration at which the composition can be used. Under normal conditions, the amount should be such as to give a per-salt concentration in solution equivalent to 0.002—0.01% available oxygen.

The bleaching compositions according to the invention should preferably contain one or more alkaline substances, in amount such that when the composition is dissolved at a suitable bleaching concentration in water, the initial pH value of the resulting solution is within the range 9—11. Most common detergent compositions contain alkaline material sufficient for this purpose. Suitable alkaline materials are, for instance, soap, alkali metal carbonates, phosphates (including orthophosphates, pyrophosphates and polyphosphates) and silicates.

The compositions according to the invention may contain organic soapless detergents, such as alkyl aryl sulphonates, alkyl sulphates and salts of esters and ethers of isethionic acid.

Compositions according to the invention must not contain water in an amount sufficient to permit appreciable chemical reaction between the components prior to use.

Solid esters lend themselves readily to incorporation in compositions in powder form, liquid esters to incorporation in pastes.

In order to obtain maximum effectiveness, the water should be agitated as the composition is added and the resultant solution should be used as quickly as possible.

The following example illustrates the invention:—

EXAMPLE

Pieces of cloth were stained by immersion in boiling tea extract for one hour. They were then rinsed, dried and ironed and their reflectance measured in a Hunter reflectometer using a blue filter.

Bleaching solutions were prepared containing

0.072% sodium dodecyl (tetrapropylene) benzene sulphonate  
0.065% sodium pyrophosphate  
0.050% sodium tripolyphosphate  
0.071% sodium sulphate  
0.018% anhydrous alkaline silicate  
0.064% sodium perborate tetrahydrate

and an amount of an ester equimolecular to the perborate. Where the ester was solid, it was initially ground with an equal weight of anhydrous sodium sulphate before incorporation.

The stained cloths were immersed in the freshly-prepared bleaching solutions at 60° C.

for 15 minutes with stirring. The cloths were then removed from the solutions, rinsed three times in distilled water, ironed and their reflectance measured.

The results are given in the following table:—

	Ester	Concentration of ester on solution	Increase in % reflectance
15	None	—	14.0
	Phenyl acetate	0.0565	20.4
	Phenyl benzoate	0.0823	22.0
	Phenyl p-nitrobenzoate	0.1010	16.9
20	Phenyl o-toluate	0.0881	16.9
	Beta-naphthyl benzoate	0.1080	15.1
	p-cresyl acetate	0.0623	21.8
	p-tert-butyl phenyl acetate	0.0798	15.0
	Sodium salt of o-carboxy phenyl acetate	0.0748	19.5

25 Use of a solution of similar composition to the above but without perborate and ester gave an increase in percentage reflectance of 9.2.

UNILEVER LIMITED,  
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Agent for the Applicants.

#### PROVISIONAL SPECIFICATION No. 5571, A.D. 1956.

#### Improvements in or relating to Bleaching and Detergent Compositions

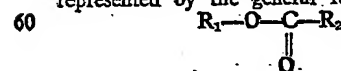
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This invention relates to bleaching compositions and in particular to compositions suitable for removing stains from textile materials.

Many detergent compositions contain an inorganic per-salt such as sodium perborate or percarbonate to provide bleaching properties. These per-salts provide a satisfactory bleach when the detergent is used at the boil, but at lower temperatures their action is too slow to be really effective within the normal washing time. This disadvantage is becoming important with the growing use of washing machines which operate at a temperature of, for example, 50–60° C. It is an object of the present invention to provide a more effective bleach in the normal washing period at this temperature than is obtained with the per-salt alone.

Compositions according to the invention also find application in the textile industry.

According to the present invention there are provided bleaching compositions which contain an inorganic per-salt together with a carboxylic ester having one or more ester groupings in the molecule. The esters may be represented by the general formula



in which additional ester groups may be attached to R<sub>1</sub> or R<sub>2</sub>.

The esters are characterised in that the radical R<sub>1</sub>—, attached to the oxygen atom of the ester link, exerts an electron-attracting effect; and the radical R<sub>2</sub> may be hydrogen, chlorine, alkyl, aryl, substituted alkyl, or substituted aryl.

The esters should preferably melt at temperatures of 90° C. or lower, or they should be substantially dissolved after stirring for 15 minutes in mildly alkaline hydrogen peroxide solutions at 60° C.

For preference the esters should not yield easily oxidisable hydrolysis products such as polyhydric phenols, unsubstituted lower aliphatic aldehydes, and alpha and beta diketones.

The types of esters which are effective are illustrated by the following examples.

(a) Esters of phenols and substituted derivatives of them, including polynuclear compounds such as the naphthols. Examples are:—

Phenyl acetate	
Phenyl benzoate	85
Phenyl o-toluate	
Diphenyl phthalate	
Phenyl p-nitrobenzoate	
Phenyl cinnamate	
Phenyl 2:4-dichlorobenzoate	90
o-cresyl benzoate	
p-cresyl acetate	
p-tertiary octyl phenyl acetate	
o-nitro phenyl benzoate	
p-nitro phenyl benzoate	95

- o-carboxy phenyl benzoate  
o-carboxy phenyl acetate  
p-carboxy phenyl acetate  
Beta-naphthyl benzoate  
p-phenyl phenyl acetate  
Resorcinol monobenzoate
- 5 (b) Ester of monohydric aliphatic alcohols containing substituents which exert an electron-attracting influence such as for instance trichloroethyl acetate.
- 10 (c) Esters of polyhydric aliphatic alcohols containing preferably 3 or more ester groups situated on adjacent carbon atoms, such as for instance:—
- 15 Glycerol triacetate  
Mannitol hexa acetate  
Sorbitol hexa acetate
- (d) Esters of mono- and disaccharides containing preferably 3 or more ester groups on adjacent carbon atoms, such as for instance:—
- 20 Fructose penta acetate  
Glucose penta acetate  
Glucose tetra acetate  
Sucrose octa acetate
- 25 (e) Esters containing 2 ester groups attached to the same carbon atom such as may be obtained by acylation of aldehydes. Examples of such esters are:—
- 30 Benzaldehyde diacetate  
Furfural diacetate  
Chloral diacetate
- (f) Esters of the enolic forms of ketones preferably not alpha- and beta-diketones or other readily oxidizable ketones. Examples of suitable esters of this type are:—
- 35  $\Delta^1$ -cyclohexenyl acetate  
Isopropenyl acetate
- Solid esters lends themselves readily to incorporation in compositions in solid form, liquid esters to incorporation in pastes.
- 40 By "inorganic per-salts" is meant a salt which will give rise to hydrogen peroxide in aqueous solution. Suitable compounds are alkali metal perborates, percarbonates, perpyrophosphates and persulfates. These are not true per-salts in the strict chemical sense but are believed to contain hydrogen peroxide of crystallisation, which is liberated in aqueous solution.
- 45
- Bleaching effects may be obtained with compositions according to the invention containing wisely varying ratios of per-salt to ester; approximately equimolecular proportions of per-salt and ester have been found effective. The proportions of per-salt and ester required in the composition will depend on the time and temperature of bleaching, the degree of bleaching required and the concentration at which the composition can be used. Under normal conditions these proportions should be such as to give a per-salt concentration in solution equivalent to 0.002 to 0.1% available oxygen.
- Included in the invention are processes of bleaching using the compositions described herein.
- The following example illustrates the invention:—
- EXAMPLE.
- Pieces of cloth were stained by immersion in boiling tea extract for one hour. They were then rinsed, dried and ironed and their reflectance measured in a Hunter reflectometer using a blue filter.
- Bleaching solutions were prepared containing
- 0.072% sodium dodecyl (tetrapropylene) benzene sulphonate  
0.065% sodium tetrapyrophosphate  
0.050% sodium tripolyphosphate  
0.071% sodium sulphate  
0.018% anhydrous alkaline silicate  
0.064% sodium perborate tetrahydrate
- and an ester in concentration as given in the table below. Where the ester was solid, it was initially ground with an equal weight of anhydrous sodium sulphate before incorporation.
- The stained cloths were immersed in the freshly-prepared bleaching solutions at 60° C. for 15 minutes with stirring. The cloths were then removed from the solutions, rinsed three times in distilled water, ironed and their reflectance measured.
- The results are given in the following table:—

	Ester	Concentration of ester in solution	Increase in % reflectance	Increase in % reflectance in absence of ester-control
100	Phenyl benzoate	0.0823	22.0	14.0
	Trichloroethyl acetate	0.0796	20.3	10.5
	Mannitol hexa-acetate	0.090	18.4	12.2
	" " "	0.180	19.7	12.2
	Glucose penta-acetate	0.065	20.3	12.1
105	" " "	0.162	23.4	12.1
	Furfural diacetate	0.0823	22.5	14.1
	$\Delta^1$ -cyclohexenyl acetate	0.0407	19.1	10.5

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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1960.  
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained